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DESIGN DEVELOPMENT INC.

MODEL 100R-5

CAL PROCEDURES & DRAWINGS

AUGUST 1986

DESIGN DEVELOPMENT, INC.

MODEL 100R-5 CALIBRATION PROCEDURES

1) INITIAL TURN ON
2) POWER SUPPLY CHECK
3) OSCILLATOR CAL
4) RETURN LOSS TRANSMITTER CAL.
5) RECEIVER LEVEL CAL
6) RECEIVER NOISE CAL
7) RECEIVER RETURN LOSS CAL.
8) MISCELLANEOUS CIRCUIT CHECK

TEST EQUIPMENT REQUIRED:-

1) OSCILLOSCOPE
2) DVOM
3) 600 OHM ATTENUATOR-BALANCE
4) TTS MODEL 100R4
5) 1 MILLIWAT REFERENCE GENERATOR
6) AC VOLT METER-HP MODEL 403B
7) DC POWER SUPPLY
8) 600 OHM RESISTOR, 0.1%
9) 900 OHM RESISTOR, 0.1%
10) 2.16 uF CAPACITOR, 1%

1.0) SECTION 1 - INITIAL TURN ON

1.1) VISUAL INSPECTION:-INSPECT THE UNIT CAREFULLY, CHECK IF ANY COMPONENTS ARE MISSING. SOLDER BRIDGES, CAPACITORS, DIODES, AND I.C.'S ARE LOADED IN THE RIGHT MANNNER.

1.2) SET DVOM TO RESISTANCE, CHECK ALL THE TIP TRANSISTORS AND VOLTAGE REGULATORS (ON TRANSMITTER BOARD) ARE NOT SHORTED TO THE HEAT-SINK.

1.3) MID-RANGE ALL POTS.

1.4) USING THE DVOM, CHECK ACROSS CAPACITORS C608, C606, AND C604. OBSERVE THAT THERE IS NO SHORT ACROSS ANY OF THEM.

2.0) SECTION 2 - INITIAL TURN ON.

2.1) USE POWER INPUT COMMON AS REFERENCE, MONITOR THE COLLECTOR OF Q605 WITH THE SCOPE. SET THE VERTICAL GAIN TO 20V/DIV, AND HORIZONTAL SWEEP TO 10 MS/DIV.

2.2) ADJUST DC POWER SUPPLY TO -48 VOLTS, AND CONNECT IT TO THE POWER INPUT OF THE UNIT UNDER TEST.

2.3) TURN POWER ON. OBSERVE THAT A CLEAN SQUARE WAVE OF 80 VOLTS PEAK TO PEAK APPEAR ON THE SCREEN, AND THE FREQUENCY IS AROUND 20K HZ. CHECK THE INPUT CURRENT SHOULD BE AROUND 280 MILLIAMPS. ADJUST THE VALUE OF R604, AND/OR R603 IF NECESSARY.

2.4) SET DVOM TO DC VOLTS, AND MONITOR ACROSS C608, CHECK THE VOLTAGE SHOULD READ -15V +/-.3V.

2.5) MONITOR ACROSS C606, THE VOLTAGE SHOULD READ +15V +/.3V.

2.6) MONITOR ACROSS C604, THE VOLTAGE SHOULD READ +5V +/-.2V.

3.0) SECTION 3 - OSCILLATOR CALIBRATION

3.1) PATCH THE 100R5 SEND TO THE TTS 100R4 RECEIVE AND SELECT SETTING AS FOLLOWS:

100R5 TRANSMITTER SWITCH
- a) NORM
- b) 600 OHM
- c) VAR-OSC LEVEL, AND
- d) VAR-OSC FREQUENCY (100HZ TO 4KHZ)

100R4 RECEIVER SWITCH
- a) 600 OHM
- b) TERM
- c) LEVEL

3.2) TURN POWER TO ON IN BOTH UNITS, AND ADJUST VAR FREQUENCY CONTROL IN THE FRONT PANEL ALL THE WAY COUNTER CLOCKWISE, ADJUST R352 TO READ 90 HZ ON THE TTS 100R4.

3.3) TURN THE VAR FREQUENCY CONTROL ALL THE WAY CLOCKWISE, THE FREQUENCY SHOULD READ ABOVE 4KHZ.

3.4) SELECT 404 ON THE 100R5, AND ADJUST R355 TO READ 404.

3.5) SELECT 1004 ON THE 100R5, AND ADJUST R357 TO READ 1004.

3.6) SELECT 2804 ON THE 100R5, AND ADJUST R358 TO READ 2804.

3.7) SELECT 1004, AND ADJUST VAR LEVEL SO THE METER READS 0.0 DBM. SELECT DBRN, C-MSG AND 1010 NOTCH FILTER ON THE 100R4, ADJUST R360 AND R359 TO READ BELOW +30 DBRN. CHECK 3KHZ AND 15KHZ TO READ BELOW 35 DBRN.

3.8) RECHECK STEPS 3.3 TO 3.6.

3.9) SELECT 1004 ON THE 100R5, AND ADJUST VAR LEVEL ALL THE WAY CLOCKWISE. ADJUST R391 TO READ 10.3 DBM. ADJUST VAR LEVEL ALL THE WAY COUNTERCLOCKWISE, THE LEVEL SHOULD READ BELOW -40.2 DBM.

3.10) SELECT 0 DBM, AND ADJUST R368 TO READ 0.0 DBM.

3.11) CHANGE FREQ TO VAR, AND 1004 HZ, ADJUST R375 TO READ 0.0 DBM ON THE METER.

3.12) SELECT -16 DBM, AND ADJUST R369 TO READ -16.0 DBM.

3.13) CHANGE LEVEL TO VAR, ADJUST IT TO READ 0.0., CHANGE VAR FREQ SETTING TO 4 KHZ TO 20 KHZ, ADJUST VAR FREQ CONTROL ALL THE WAY COUNTERCLOCKWISE, THE FREQUENCY SHOULD READ BELOW 4 KHZ, AND ALL THE WAY CLOCKWISE, THE FREQUENCY SHOULD READ ABOVE 22 KHZ. OBSERVE THAT THE LEVEL SHOULD NOT CHANGE MORE THAN 0.2 DBM, AND REPEAT THE STEP WITH THE VAR LEVEL SET AT +9.0 DBM, THE LEVEL SHOULD NOT CHANGE MORE THAN 0.2 DBM.

3.14) SELECT 0 DBM AND 1004, AND CHANGE TO 900 OHM ON BOTH 100R5 AND TTS 100R4 ADJUST R392 TO READ 0.0 DBM ON THE METER.

4.0) <u>SECTION 4 - RECEIVER CALIBRATION-LEVEL</u>

4.1) PATCH 100R5 RECEIVE TO 100R4 SEND, AND SETUP THE EQUIPMENTS AS FOLLOWS:-

100R5 RECEIVER
- a) 600 OHM
- b) TERM
- c) LEVEL, AND
- d) L/N

100R4 SEND
- a) 600 OHM
- b) 1004, AND
- c) VAR LEVEL

4.2) MONITOR ACROSS C31 WITH THE DVOM AND SET IT TO READ DCV. INCREASE THE 100R4 LEVEL OUTPUT TO APPROXIMATELY +3.5 DBM SO THAT THE DVOM READS 4.000 VOLTS. INTRODUCE 12 DB OF ATTENUATION, AND ADJUST R67 TO READ 1.004 VOLTS. REPEAT THE ABOVE STEP FOR PROPER TRACKING.

4.3) INCREASE LEVEL SO THE 100R5 DISPLAYS +4.0 DBM, INTRODUCE 13 DB OF ATTENUATION, ADJUST R81 TO READ +9.0. REPEAT THE PROCESS FOR PROPER

TRACKING. CHECK TRACKING ALL THE WAY TO -50.0, OBSERVE THAT THE DISPLAY WILL BLANK BELOW -50.0 DBM EXCEPT THE MINUS SIGN, AND WILL BLANK ABOVE +15.0 DBM EXCEPT THE PLUS SIGN.

4.4) PATCH THE REFERENCE GENERATOR (600 OHM) TO THE RECEIVE INPUT OF THE 100R5, ADJUST R7 TO READ 0.0. SWITCH BOTH 100R5 AND REFERENCE GENERATOR TO 900 OHM, AND ADJUST R8 TO READ 0.0 DBM.

4.5) PATCH THE 100R5 SEND TO THE 100R5 RECEIVE INPUT, AND ADJUST 100R4 TO SEND 0.0 DBM AT 1004 HZ TO THE 100R5, SLOWLY SWEEP THE SEND FREQUENCY FROM 100 HZ TO 20 KHZ, CHECK THAT THE 100R5 SHOULD READ WITHIN +/-0.2 DB.
*SELECT A CAPACITOR ACROSS R33 OR R34 IF NECESSARY.

4.6) SET THE METER TO READ 0.0 DBM, AND 1004. SELECT BP (0.2-5 KHZ), ADJUST R248 TO READ 0.0. CHECK THE -3DB POINT AT 200 HZ AND 5 KHZ.

4.7) SLOWLY SWEEP THE FREQUENCY TO 10 KHZ, OBSERVE THE FREQUENCY DECIMAL WILL CHANGE TO 10 HZ RESOLUTION AS THE FREQUENCY EXCEED 10 KHZ. SLOWLY DECREASE THE SEND FREQUENCY, OBSERVE THAT THE DECIMAL WILL CHANGE BACK TO 1 HZ RESOLUTION BELOW 9.000 KHZ.

5.0) SECTION 5 - RECEIVER NOISE CALIBRATION.

5.1) PATCH THE 100R4 SEND TO THE 100R5 RECEIVE INPUT. AND SETUP EQUIPMENTS AS FOLLOWS:-

100R4 SEND
- a) 600 OHM
- b) VAR LEVEL, AND
- c) VAR FREQ

100R5 RECEIVE
- a) 600 OHM
- b) TERM, AND
- c) C-MSG FILTER

5.2) SET 100R5 SEND TO -0.4, AND 1004 HZ. ADJUST R35 SO THE READING OF THE METER JUST CHANGE FROM +89 TO +90 DBRN. SET LEVEL TO 0.0 DBM, AND CHECK THE FILTER FREQUENCY RESPONSE AGAINST THE TABLE BELOW:-

FREQ	READING	TOLERANCE
200	+65	+/-2
400	+79	1
700	+87	1
1000	+90	0
1500	+89	1
2800	+88	1
3500	+82	2
5000	+61	3

5.3) SELECT 3KHZ FILTER, AND 15 KHZ FILTER AND CHECK THEM AGAINST THE TABLE BELOW:-

3KHZ FILTER

FREQ	READING	TOLERANCE
400	+90	+/-1
1000	+90	0
3000	+87	-1

15KHZ FILTER

FREQ	READING	TOLERANCE
400	+90	+/-1
1000	+90	0
3000	+90	1
15000	+87	1

5.4) SET FREQUENCY TO 1004, AND SELECT C-MSG FILTER, CHECK TRACKING TO 0 DBRN, ADJUST R23 IF NECESSARY TO READ PROPER WHEN BELOW +10 DBRN. CHECK TO SEE THAT WHEN BELOW +0 DBRN THE DISPLAY WILL BLANK EXCEPT THE MINUS SIGN, AND WHEN ABOVE +95, THE DISPLAY WILL BLANK EXCEPT THE PLUS SIGN

5.5) SET UP THE EQUIPMENT AS FOLLOWS:-

100R4 SEND
- a) 600 OHM
- b) 0 DBM, AND
- c) 1004

100R5 RECEIVE
- a) 600 OHM
- b) TERM
- c) 3KHZ FILTER, AND
- d) NOTCH

5.6) ADJUST R217 AND R228 TO OBTAIN THE LOWEST READING (BELOW +30 DBRN). CHANGE FREQUENCY TO 404 HZ, ADJUST R211 TO READ +90 DBRN.

5.7) INCREASE FREQUENCY TO 862 HZ, ADJUST R205 TO READ +87 OR +88 DBRN.

5.8) INCREASE FREQUENCY TO 1182 HZ, ADJUST R239 TO READ +87 OR +88 DBRN.REPEAT STEPS 6.7 AND 6.8 FOR PROPER READINGS.

5.9) CONNECT THE TIP OUTPUT OF THE 100R4 SEND TO PIN 8 OF THE TS-1 CONNECTOR OF THE 100R5, AND THE RING OUTPUT TO BOTH THE TIP AND RING RECEIVE INPUT OF THE 100R5. ADJUST SEND LEVEL TO 0.0 DBM AND 1004 HZ, SELECT C-MSG AND NOISE N/G (NO 1010 HZ NOTCH FILTER). THE METER SHOULD READ +90. DECREASE LEVEL TO -40 DBM, THE METER SHOULD READ +50. INCREASE THE LEVEL TO +15 DBM, THE METER SHOULD READ +105.

5.10) USE A JUMPER, SHORT PIN 11 OF U28 TO GROUND. CHECK THAT THE FREQUENCY READOUT WILL DISPLAY THE PROPER FREQUENCY.

6.0) SECTION 6 - MISCELLANEOUS CIRCUIT CHECKS.

6.1) SELECT 600 OHM, 0 DBM, AND 1004 ON THE SEND, AND 600 OHM, TERM, AND LEVEL ON THE RECEIVE SELECT DISP, AND ADJUST R395 (TRANSMITTER BOARD) TO READ 0.0.

6.2) SELECT NORM/XFR SWITCH, CHECK NOW THE SEND BECOMES REC, AND THE REC BECOMES SEND.

6.3) SET THE DVOM TO MILLIAMP DC, AND CONNECT IT IN SERIES WITH THE 600 OHM RESISTOR, SEND OUTPUT AND THE -48 VOLT POWER SUPPLY. SELECT HOLD SWITCH, OBSERVE THE DVOM SHOULD READ AROUND 25 MA. REPEAT THE SAME STEP FOR THE RECEIVE INPUT.

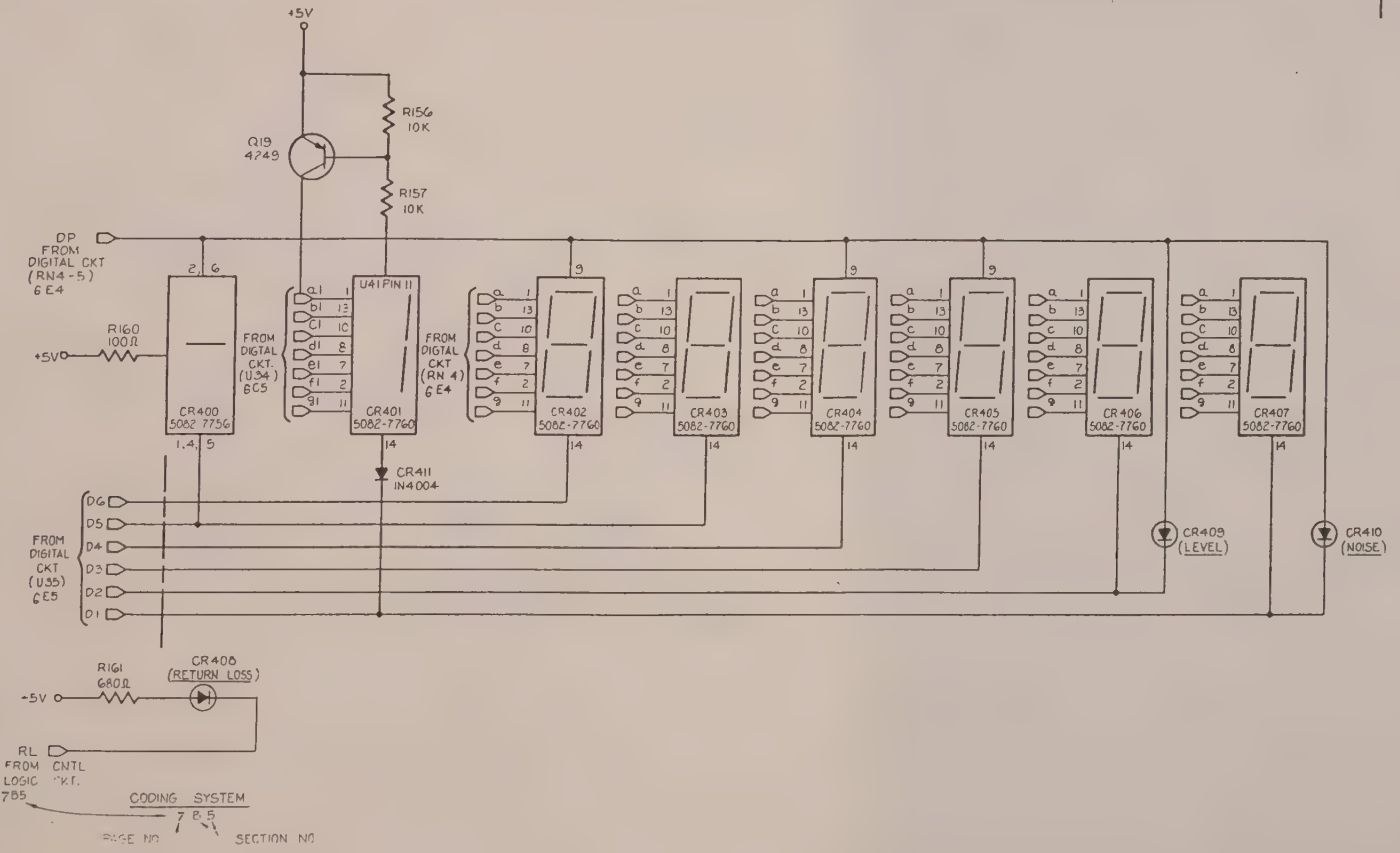
6.4) SELECT S/R DIAL. USING THE DVOM, CHECK THAT THE RECEIVE TIP AND RING SHOULD CONNECT TO THE TIP AND RING OF THE DIAL OUTPUT.

6.5) MONITOR PINS R AND S OF TS-1 WITH A SCOPE. CHECK FOR GOOD AUDIO OUTPUT. TURN THE VOLUME CONTROL ON THE FRONT PANEL TO CHECK AUDIO.

6.6) CONNECT 100A-3 TO PINS 6 AND 7 OF TS-1 CONNECTOR, CHECK THE SERIAL DISPLAY FOR PROPER OPERATION. ALSO CHECK POSITION SERVE STRAPPING OPTION.

6.7) SEAL ALL POTS.

-END-



NOTE:

1. ALL CONNECTORS TO PAGE 6.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±	ddi DESIGN DEVELOPMENT, INC. 1440 ATTEBERRY LANE · SAN JOSE, CA 95131 (408) 946-6776	
APPROVALS / DATE	SCHEMATIC DRAWING	
DRAWN DLS 4-22-86	100R-5 DISPLAY CKT.	
CHECKED	SCALE NONE / SIZE C / DRAWING NO 80-6741 -1011	
ISSUE	DO NOT SCALE DRAWING / SHEET 1 OF 11	

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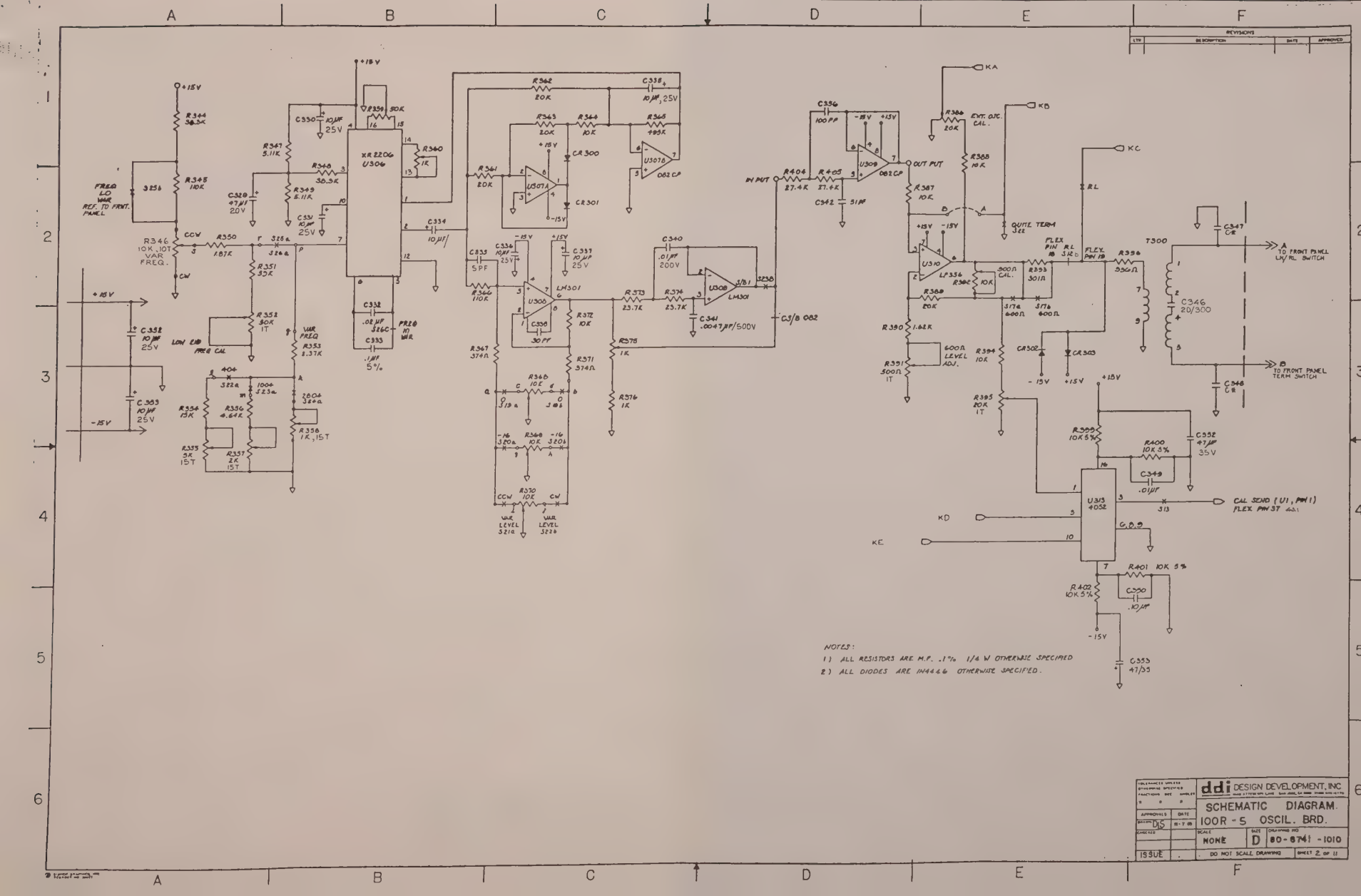
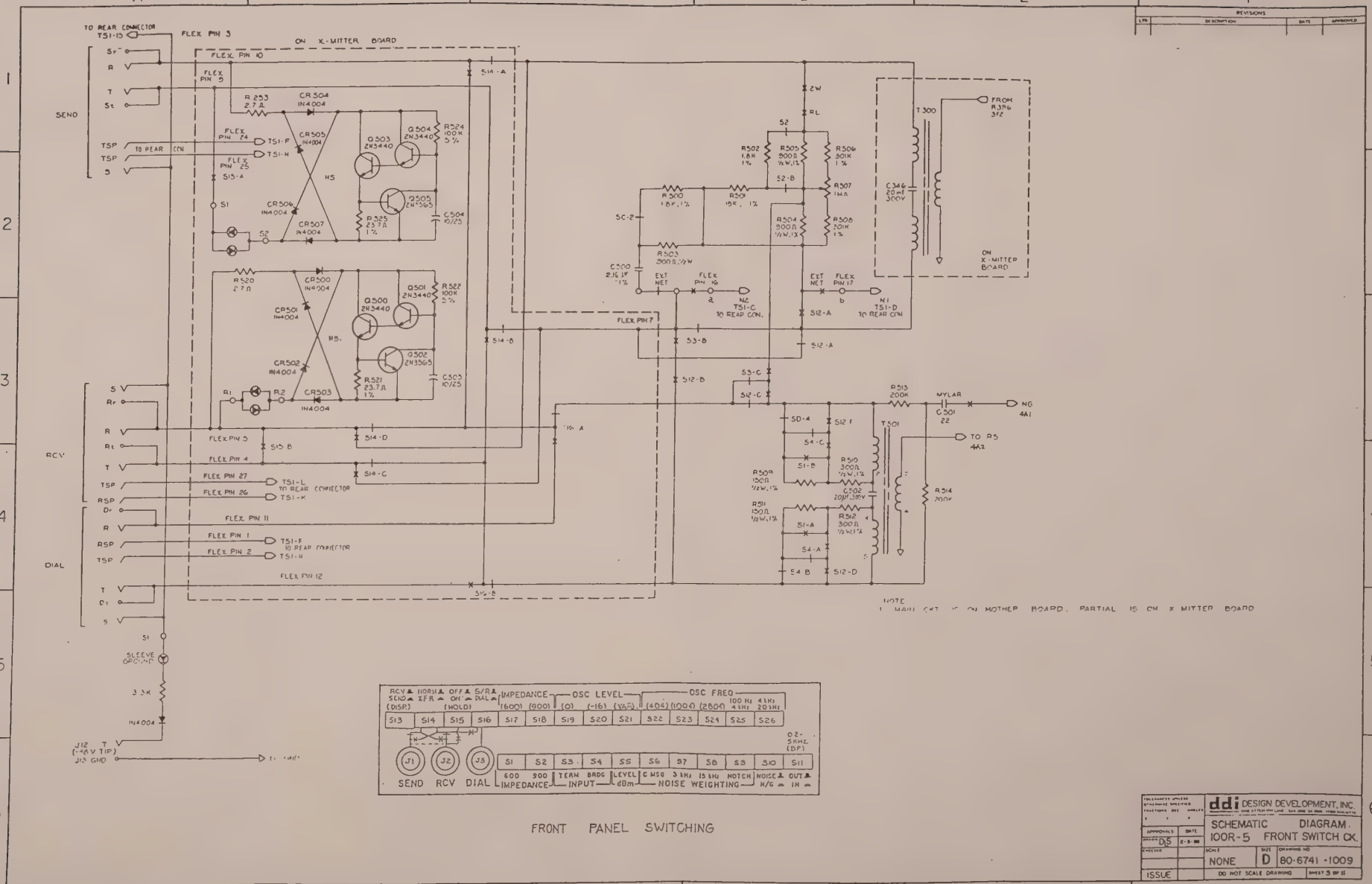
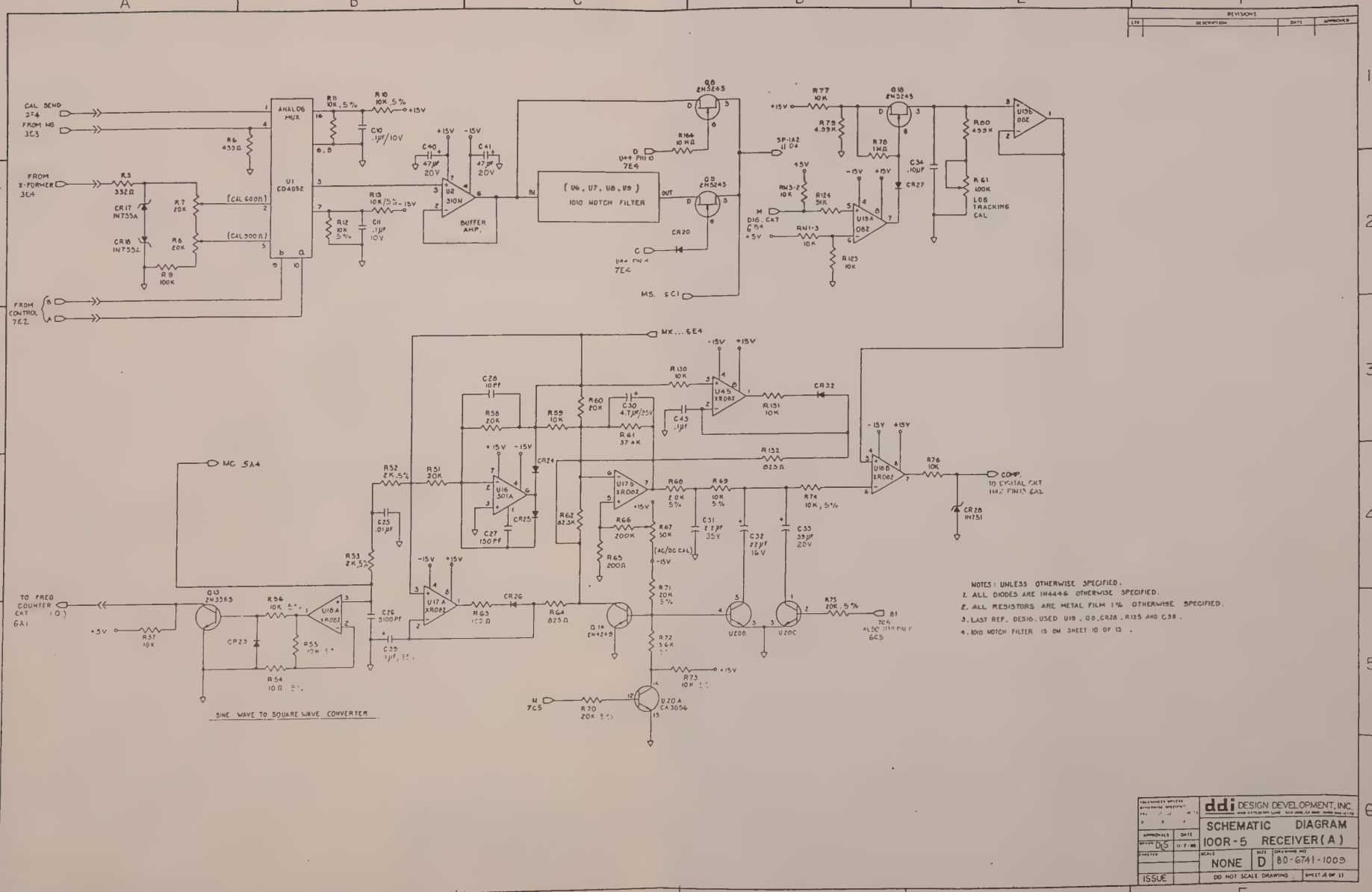

REVISIONS
LTR DESCRIPTION DATE APPROVED
+15V
-15V
R344 30.1K
R345 10K
FREQ LO VAR REF. TO FRNT. PANEL
R346 10K, 10T VAR FREQ.
CCW
CW
R350 1.87K
R351 35K
R352 50K 1T
LOW END FREQ CAL
VAR FREQ
R353 8.37K
C332 10μF 25V
C333 .01μF 326C
.1μF 5%
FREQ HI VAR
C328 47μF 20V
C329 10μF 25V
C330 10μF 25V
R347 5.11K
R348 30.3K
R349 8.11K
R339 50K
XR 2206 U306
R340 1K
C334 10μF
R342 20K
C338 10μF, 25V
R343 20K
R344 10K
R345 499K
U307B 082 CP
CR300
CR301
R341 20K
U307A
C335 5PF
C336 25V
C337 10μF 25V
R346 110K
LM301
C340 .01μF 200V
U308 LM301
C341 .0047μF/500V
C3/8 082
R373 23.7K
R374 23.7K
R372 10K
R371 374Ω
R378 1K
R376 1K
R347 374Ω
R336 10K
R370 10K
VAR LEVEL 321a
VAR LEVEL 322a
R334 13K
R336 4.64K
R335 5K 15T
R357 2K 15T
R358 1K, 15T
INPUT
R404 27.4K
R405 7.15K
C342 .51μF
C336 100 PP
U309 082 CP
OUT PUT
R387 10K
KA
KB
KC
R386 20K
EXT. OSC. CAL.
R388 10K
QUITE TERM 322
RL
FLEX PIN 18
FLEX PIN 19
U310 LF336
R389 500Ω CAL.
R393 301Ω
R394 10K
R396 20K
R390 1.62K
R391 500Ω 1T
600Ω LEVEL ADJ.
R384 10K
R385 20K 1T
CR302
CR303
T300
C347 CR
C346 20/300
C348 CR
A TO FRONT PANEL LR/RL SWITCH
B TO FRONT PANEL TERM SWITCH
R399 10K 5%
R400 10K 5%
C352 47μF 35V
C349 .01μF
U313 4052
CAL SEND (U1, PIN 1) FLEX PIN 37 431
313
G.D.S
R401 10K 5%
R402 10K 5%
C350 .10μF
C353 47/35
NOTES:
1) ALL RESISTORS ARE M.F. .1% 1/4 W OTHERWISE SPECIFIED
2) ALL DIODES ARE IN4446 OTHERWISE SPECIFIED.
ddi DESIGN DEVELOPMENT, INC.
SCHEMATIC DIAGRAM.
100R-5 OSCIL. BRD.
APPROVALS DATE
DRAWN DLS 11-7-80
CHECKED
ISSUE
SCALE NONE
SIZE D
DRAWING NO 80-6741-1010
DO NOT SCALE DRAWING
SHEET 2 OF 11



FRONT PANEL SWITCHING

ddi DESIGN DEVELOPMENT, INC.			
SCHEMATIC DIAGRAM. 100R-5 FRONT SWITCH CK.			
APPROVALS	DATE		
DRAWN DS	8-3-88		
CHECKED			
SCALE NONE	SIZE D	DRAWING NO 80-6741-1009	
ISSUE	DO NOT SCALE DRAWING	SHEET 3 OF 11	

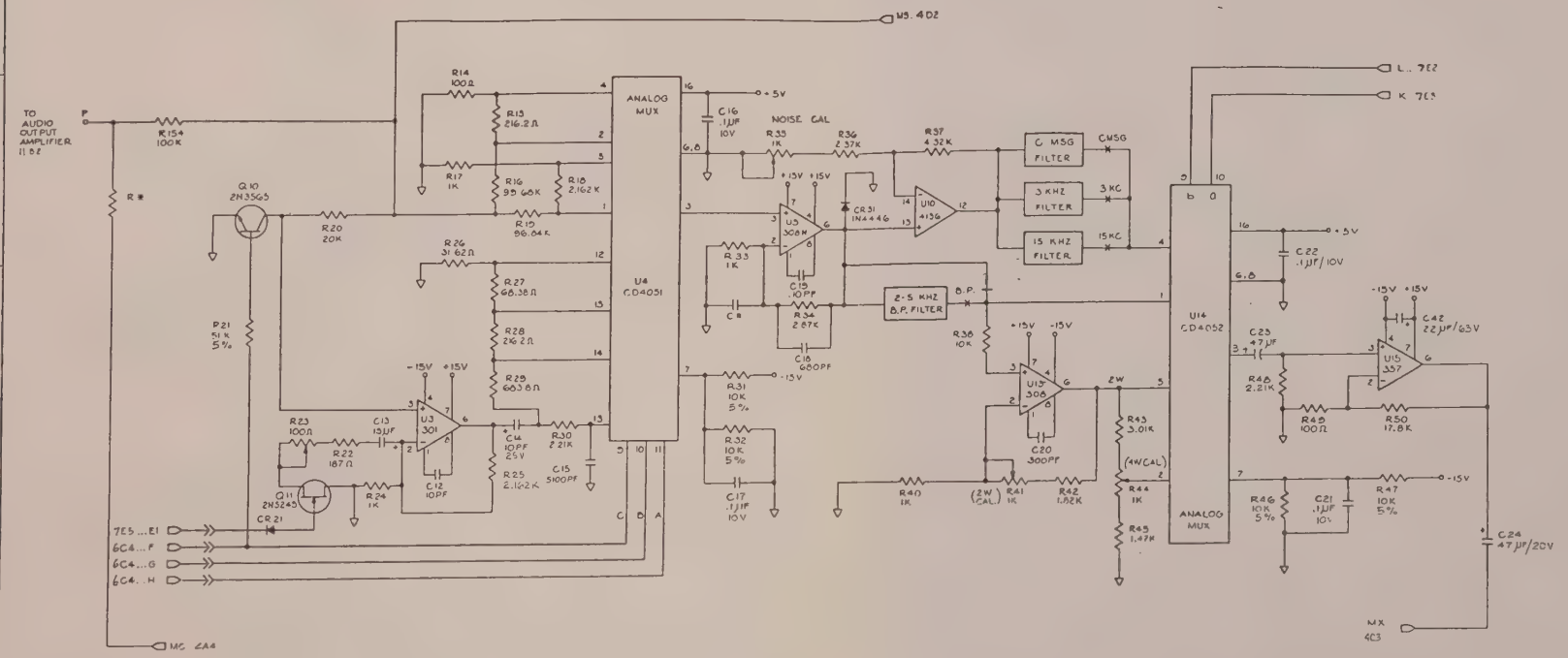


NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL DIODES ARE IN4446 OTHERWISE SPECIFIED.
2. ALL RESISTORS ARE METAL FILM 1% OTHERWISE SPECIFIED.
3. LAST REF. DESIG. USED U19, Q10, CR28, R125 AND C38.
4. 1010 NOTCH FILTER IS ON SHEET 10 OF 13.

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED

APPROVALS	DATE	ddi DESIGN DEVELOPMENT, INC.
DRAWN DLS	11-7-88	SCHEMATIC DIAGRAM
CHECKED		100R-5 RECEIVER (A)
ISSUE		SCALE NONE · SIZE D · DRAWING NO 80-6741-1009
		DO NOT SCALE DRAWING · SHEET 4 OF 13



NOTES

1 ALL DIODES ARE IN4446 OTHERWISE SPECIFIED

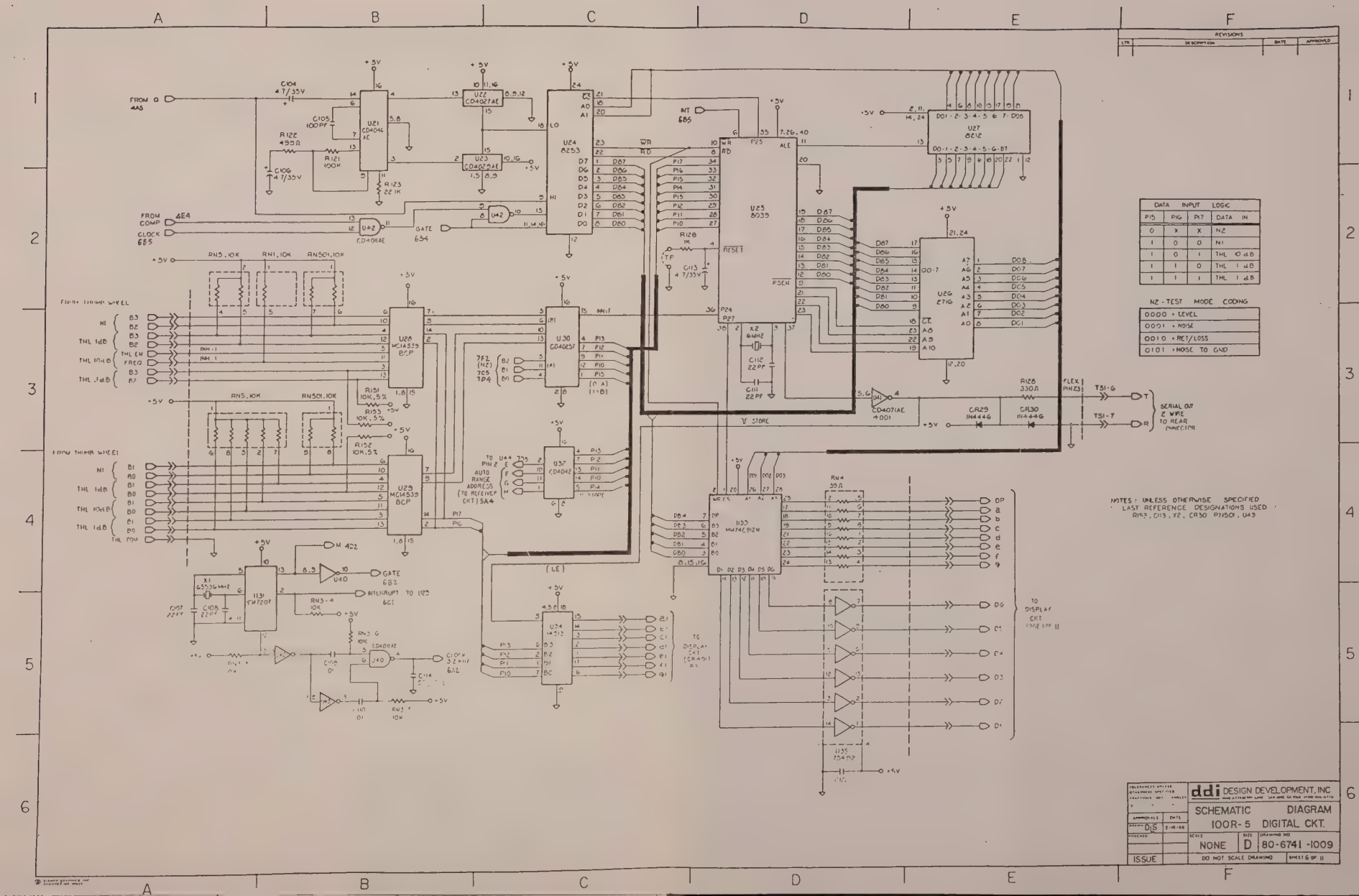
2 ALL RESISTORS ARE METAL FILM 1% OTHERWISE SPECIFIED

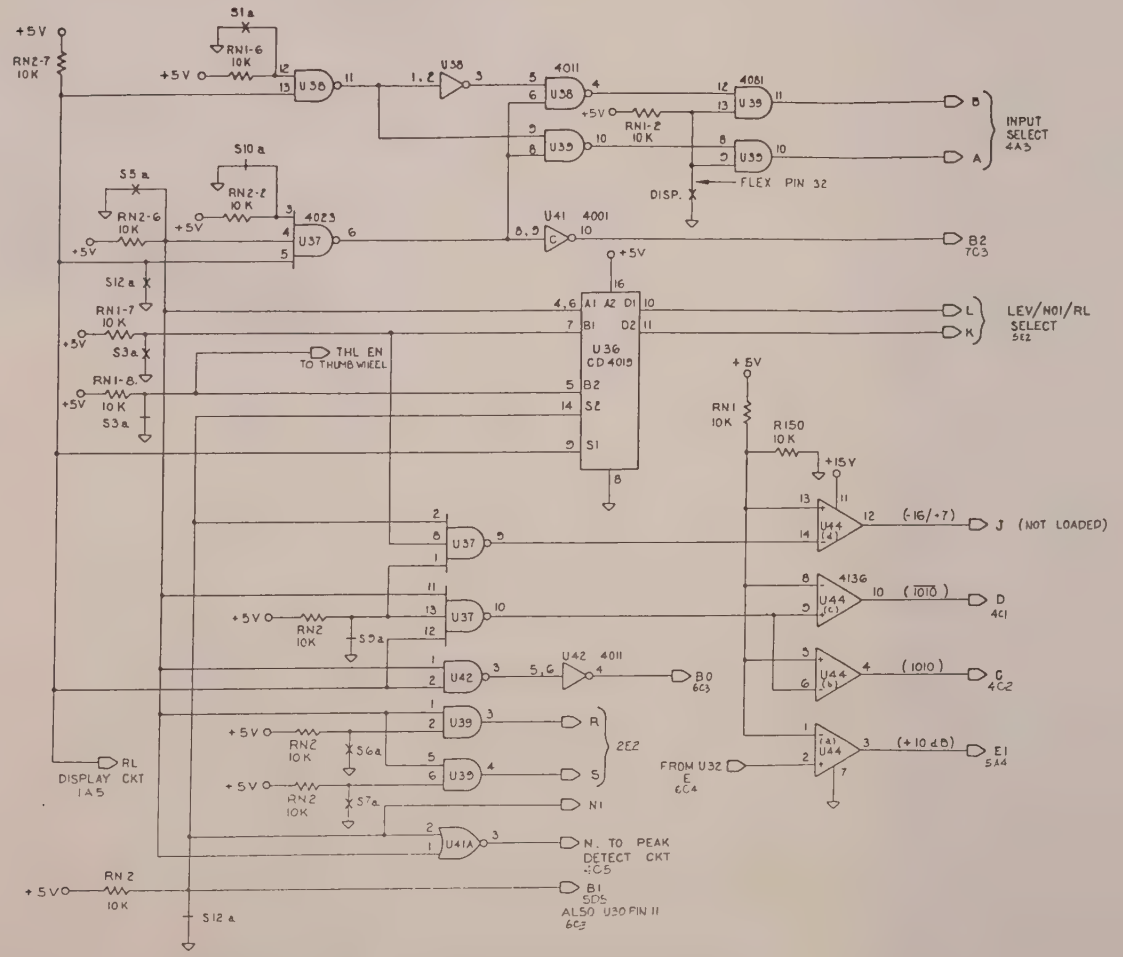
3 LAST REF. DESIG USED U5, Q6, CR26, R125, AND C38.

4 CMSG FILTER, 3 KHZ LAT FILTER, 15KHZ LAT FILTER CKT. ARE ON SHEET 8 OF 11.

5 .2-3 KHZ B.P. FILTER CKT IS ON SHEET 9 OF 11.

		ddi DESIGN DEVELOPMENT, INC.	
		SCHEMATIC DIAGRAM	
		100R-5 RECEIVER (B)	
APPROVALS	DATE	SCALE NONE	SIZE D DRAWING NO 30-6741-1009
DRAWN DJS	11 8 85	DO NOT SCALE DRAWING	SHEET 5 OF 11
CHECKED			
ISSUE			


REVISIONS
LTR DESCRIPTION DATE APPROVED
DATA INPUT LOGIC
P15 P16 P17 DATA IN
0 X X NZ
1 0 0 NI
1 0 1 THL 10 dB
1 1 0 THL 1 dB
1 1 1 THL 1 dB
NZ-TEST MODE CODING
0000 = LEVEL
0001 = NOISE
0010 = RET/LOSS
0101 = NOISE TO GND
NOTES: UNLESS OTHERWISE SPECIFIED
LAST REFERENCE DESIGNATIONS USED
R153, C113, X2, CR30 PN501, U43
SERIAL OUT E WIRE TO REAR CONNECTOR
TO DISPLAY CKT SHEET 10F 11
ddi DESIGN DEVELOPMENT, INC.
SCHEMATIC DIAGRAM
100R-5 DIGITAL CKT.
NONE D 80-6741-1009
DO NOT SCALE DRAWING
ISSUE



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TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS DEC ANGLES
± ± ±

APPROVALS	DATE
DRAWN DLS	1-13-86
CHECKED	
ISSUE	

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SCHEMATIC DIAGRAM
100R-5 CONTROL LOGIC CKT.

SCALE	SIZE	DRAWING NO.
NONE	C	80-6741-1009

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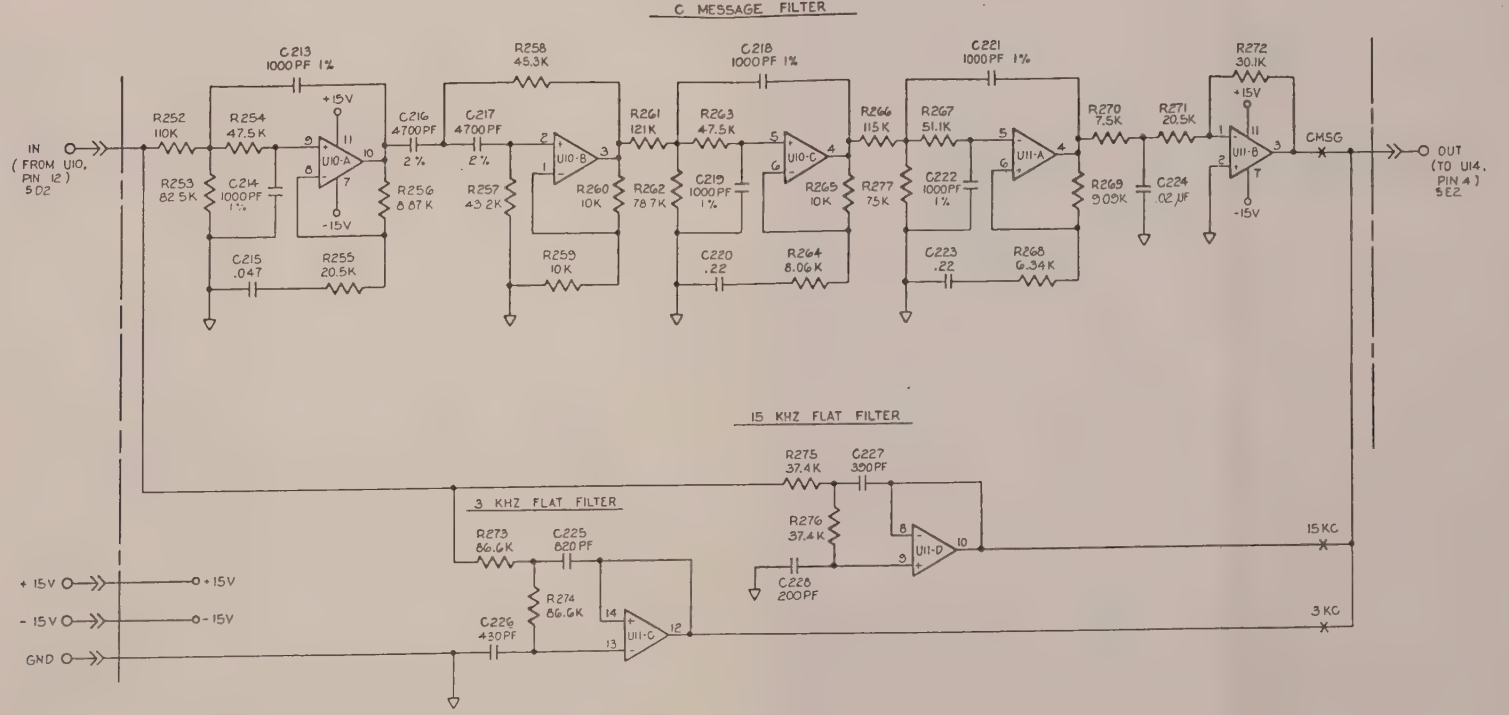

NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE MF. (METAL FILM) 1%.
2. ALL OPERATIONAL AMPLIFIERS ARE S/B 4136.

TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS	DEC	ANGLES
±	±	

APPROVALS	DATE
DRAWN DJS	4-18-86
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ISSUE	

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SCHEMATIC DRAWING
100R-5 FILTER CKT.

SCALE	SIZE	DRAWING NO
NONE	C	80-6741-1009

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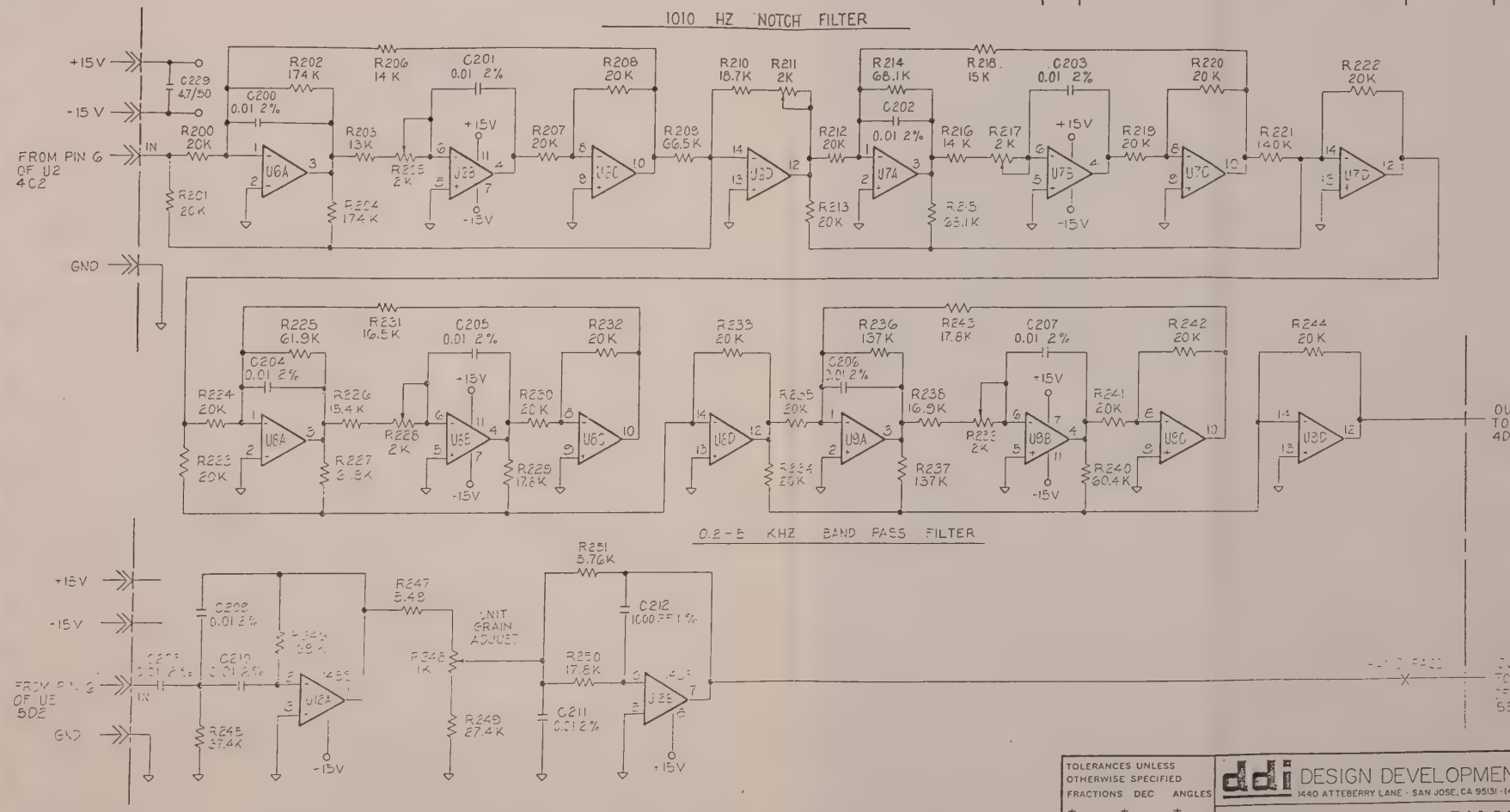

NOTES:
1. ALL RESISTORS ARE METAL FILM 1/4 W, 1%
2. ALL OPERATIONAL AMPLIFIERS ARE RC4136 UNLESS OTHERWISE SPECIFIED.
3. U6, U7, U8, AND U9 = UA4136PC.

TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS	DEC	ANGLES
±	±	±

APPROVALS	DATE
DRAWN DLS	2-21-86
CHECKED	
ISSUE	

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1440 ATTEBERRY LANE · SAN JOSE, CA 95131 · (408) 946-6770

SCHEMATIC DIAGRAM
100R-5 NOTCH & B.P. FILTER

SCALE	SIZE	DRAWING NO.
NONE	B	80-6741-1009

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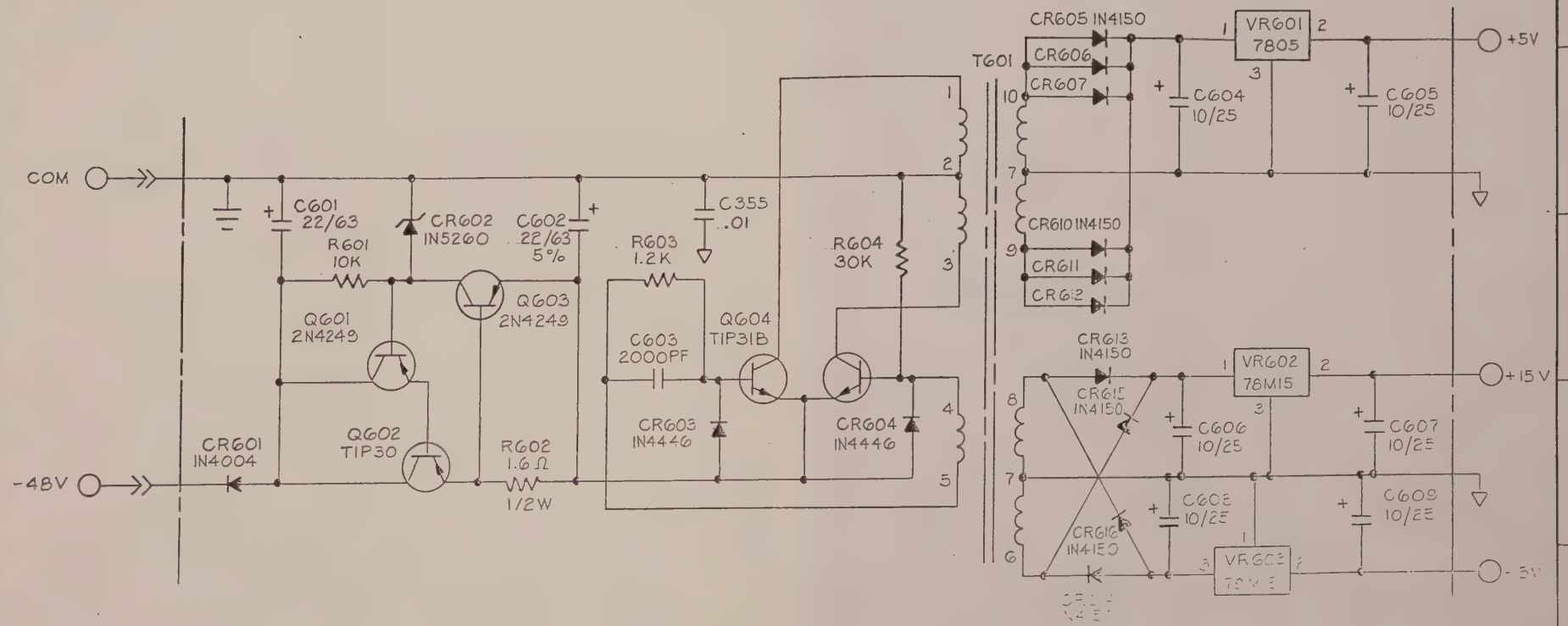

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± . ±	DESIGN DEVELOPMENT, INC. 1440 ATTESBERRY LANE SAN JOSE, CA 95131 (408) 946-6770		
APPROVALS / DRAWN DLS / CHECKED	DATE 11-8-85	SCHEMATIC DIAGRAM 100R-5 POWER SUPPLY(-48)	
ISSUE		SCALE NONE	SIZE B
		DRAWING NO. 80-6741 -1010	
		DO NOT SCALE DRAWING	SHEET 10 OF 11

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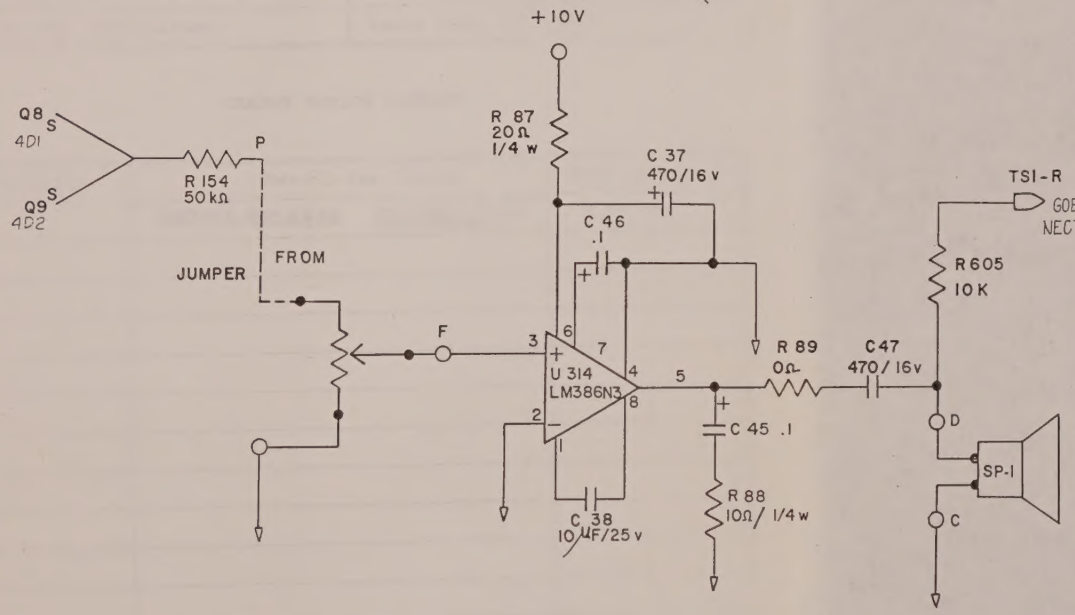

USED ON		
MODLE	DWG NO.	ISSUE
100R-5	80-6741-1009	
100P-4	: 6742 :	
ADC 1761	: 6741 :	
ADC 1763	: : :	

TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS	DEC	ANGLES
±	±	±

APPROVALS	DATE
DRAWN DLS	5-7-85
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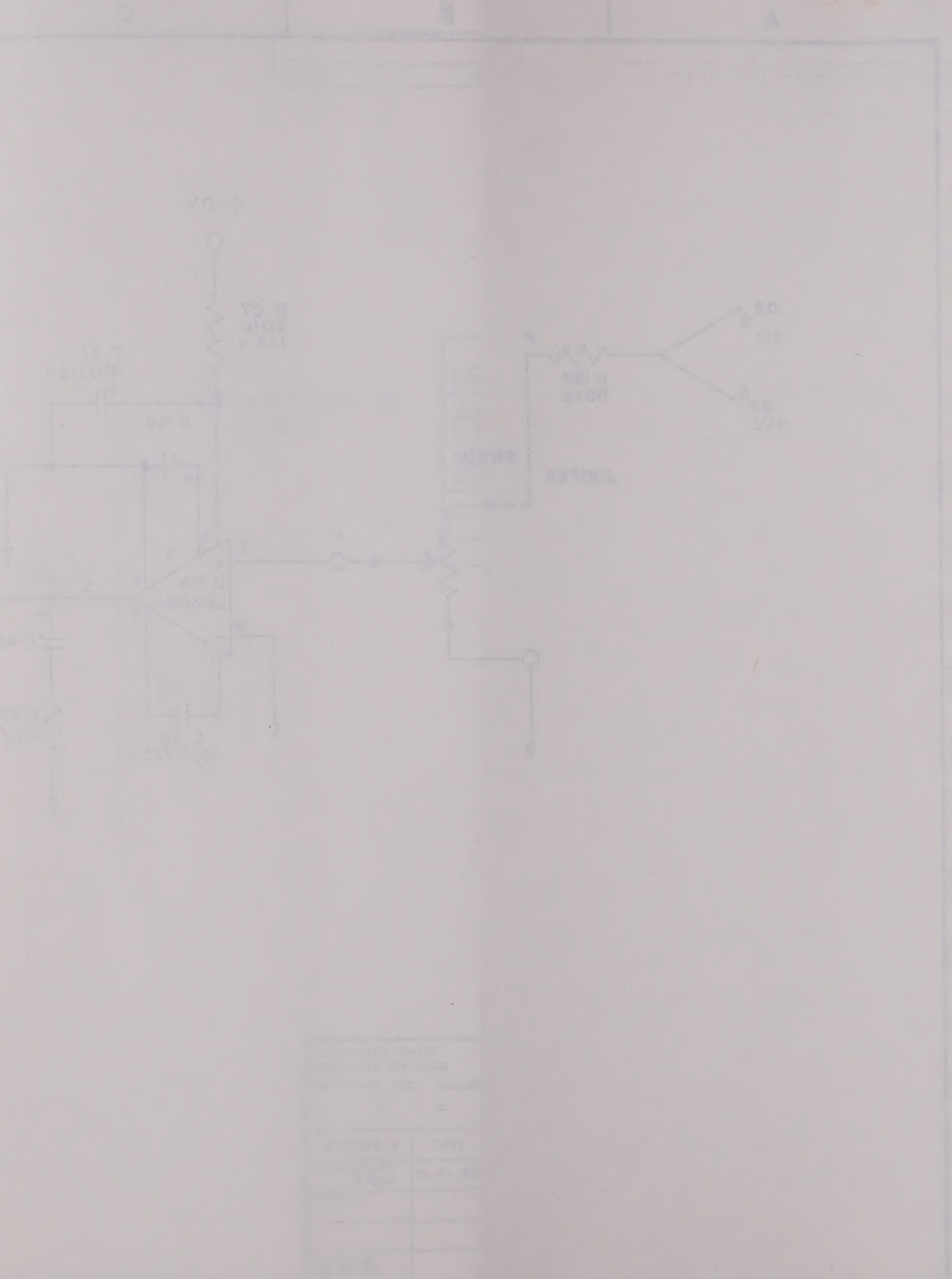
SCHEMATIC DRAWING

100R-5 AUDIO MONITOR CKT.

SCALE	SIZE	DRAWING NO.
NONE	B	80-6741-1009

DO NOT SCALE DRAWING



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CHANGE NOTICE SUMMARY

Revision	Reason for Change	Date of Change
A	INITIAL RELEASE DON PERRITT STAFF ENGINEER	12/15/93

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